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Energy Efficiency Education in Aboriginal Communities of Western Australia

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Abstract

The increasing costs of fuel for diesel powerhouses in remote indigenous communities of Australia that have increasingly limited funds is demanding a shift towards more efficient energy management. Residents, staff and community management need to develop an energy conservation ethic and reduce the typical consumption figures experienced. An energy efficient household may use less than 10 kW.hr/day while an inefficient household may use over 50 units/day as a result of poor building design, lack of understanding of energy issues, ineffective cost recovery procedures, and appliances left on continuously by non-indigenous staff as a result of inappropriate entitlements. Excessive energy consumption will result in a renewable energy system size with a cost that is far beyond the means of any community. In Western Australia an Energy Efficiency Education Program Package (EEEPack) for Aboriginal communities is currently being implemented by the Remote Area Development Group (RADG) at Murdoch University. The package is only one part of a wider strategy that needs to be continued if renewable energy technologies are to be progressively introduced and sustained.

1. Introduction

Power generation in remote Aboriginal communities is generally provided by diesel fuelled generating sets. In some smaller communities this is combined with solar powered inverters with battery storage. Operating costs associated with power stations include management, maintenance, fuel, lubricants and filters. The Commonwealth Government Aboriginal and Torres Strait Islander Commission (ATSIC) provides funding to communities to cover these operating costs, the level of funding being based on historical expenditure and is allocated through the relevant Regional Councils. Over recent years ATSIC has been concerned with increasing recurrent expenditure, in particular the cost of fuel.

Energy usage in communities covers normal domestic consumption, commercial usage (stores, bakeries, etc), essential services infrastructure, small industrial usage, non-community users such as administration buildings, schools, teachers houses, clinics and recreation centres. Most users are not metered and cost recovery is generally not related to actual consumption or user category. Many communities raise some of the funds for operating power plants and the purchase of fuel by a system of collective cost recovery ("chuck-in").

Community education in regard to energy conservation has not previously been addressed, although some communities are aware of the increasing budgetary pressures being experienced. The Energy Efficiency Education Program (EEEP) is aimed at increasing awareness of energy usage and conservation, and is ultimately intended to provide an impetus for the adoption of efficient energy consumption practices within communities. It is also intended to provide an introduction to the installation of individual metering related to appropriate tariffs.

The EEEP is mainly funded by ATSIC with some funding also from the Western Australian Office of Energy, the Aboriginal Affair Department and the Western Australian Ministry of Housing. These four also make up the Western Australia Energy Conservation Education Package Working Group (ECEPWG)

In addition, the energy conservation education of executive bodies, such as Community Councils and staff and ATSIC Regional Councils, together with service providers, such as ATSIC, the Western Australian Aboriginal Affairs Department (AAD) and the WA Ministry of Housing regional staff, has also not previously been addressed. These bodies are responsible for resource allocation and monitoring and are becoming very aware of the resource constraints being experienced in relation to the funding of energy generation and distribution (Ove Arup & Partners, 1999).

This paper will explain the nature of energy use in indigenous communities, how the package (the 'EEEPack') was delivered, evaluation to date, and what is to be expected from the program in the future.

2. Current Energy Use Characteristics

The following three case studies provide more detail on the energy usage patterns typically found in remote indigenous communities.

Healey Engineering (1999a) conducted an energy audit at the large (approx. 300 people) remote Jigalong Aboriginal Community of the Western Desert region in 1997 and again in 1998. The findings can be roughly summarised as: 65 community houses consumed ~50% of the electricity generated; 15 staff houses consumed ~20%; and community facilities consumed ~30%. Staff housing has a very high consumption of 40-70 units/day due to the use of multiple air-conditioners. It is likely the latter 2 sectors use an excessive proportion of the energy and energy saving efforts should target these. The total cost of generation was calculated as 39 cents/unit with the fuel component of generation at 22 cents/unit. It is expected that consumption will increase by 40% over the next "couple of years" with overall settlement improvements and the increase in the number of air-conditioners so that the new pattern will become: 75 community houses will consume ~70% of the electricity generated; 15 staff houses ~15%; and community facilities ~15%. In the future community housing will become the major consumption sector due to the increase in numbers but largely as a result of increased use of air-conditioning. Energy efficiency education will have to focus on this sector in the longer term. With careful use one household may consume only 13 units/day (but this figure can more than double very easily through lack of care). Prepayment meters were recommended for housing and a credit meter for the store.

Another energy audit, also by Healey Engineering (1999b) conducted at the large (approx. 400 people) remote Oombulgarri Aboriginal Community of the East Kimberley (Wunan ATSIC) region in 1997 and again in 1998. The findings can be roughly summarised as: 45 community houses consumed ~40% of the electricity generated; 15 staff houses consumed ~20%; and community facilities consumed ~40%. The "chuck-in" system was used for cost recovery and this was well managed and to be retained. Services and staff housing were metered and Western Power regional tariffs applied. The total cost of generation estimate was 41 c/unit and the fuel component of generation was 24 c/unit. It was expected that energy use would increase by 66% over the next 10 years with an ambitious program to add many new community facilities and 49 new houses. The use of air-conditioning and other appliances would increase also. The community was favourable to the introduction of prepayment meters. Again the focus of energy saving measures would need to be on staff housing now and in the longer term energy efficiency education would need to target the community residents.

The small Buttah Windee Aboriginal Community is 4.5 km from the Meekatharra township in the Midwest (Yamatji ATSIC) region where there is a regular population of 30 people of 5 families with up to 50 when visitors are present. The permanent population is expected to rise to 50 with the addition of more houses and facilities upgrades and a load estimate of 154 kW/day was made in the study (Power and Energy Services, 1999) for this future situation which is modest. The study found

that a Western Power transmission line was the cheapest power supply option. PV was marginally too expensive and there was not a sufficient wind resource. Various sensible energy efficiency recommendations were made including the use of climate sensible designed housing with heavy internal thermal mass. The current behaviour of leaving doors and windows open was noted which would need to be modified to avoid energy wastage during heating and cooling.

Connell Wagner (1999), consulting engineers were contracted to conduct a desktop study of the energy usage and fuel efficiency of 67 WA Aboriginal communities with 17 communities being visited for more detail. The data sought was often not available due to the following variety of reasons:

Meter readings were not recorded;
Meters were broken or set up incorrectly;
Uncertainties in meter readings;
Fuel and energy readings were not made over the same reporting periods.

Consequently most of their Key Performance Indicators could not be fully commented on and the database could not be established. However, the following crude figures were indicative only in some communities and could not be transferred to others: Total cost of generation was about 34 c/kWh but many costs could not be included; Energy usage fuel efficiency was 3.3 kWh/litre but this was the average for only a small sample. Because this study has confirmed that there is minimal recording of fuel and energy use in communities and the database has not been established it is unlikely that the EEEP will have a useful benchmark for quantitative evaluation after education program has been delivered.

3. Development of the Energy Efficiency Education Package (EEEPack)

The Working Group contracted the International Centre for the Application of Solar Energy (CASE) in Perth to prepare the EEEPack for WA Aboriginal communities. CASE prepared the EEEPack after community consultations and conducted a pilot program at the West Kimberley Aboriginal communities of Beagle Bay, Looma and Broome in 1998. The CASE findings of their review of previous education packages in Aboriginal communities were:

The lack of relevant materials developed for Aboriginal people - especially adults,
Existing materials are usually inappropriate for Aboriginal Communities,
Videos were viewed as not appropriate,
Any messages and themes need to be simple and clear,
Media choices should be chosen to suit the target audiences or a combination of media.

The EEEPack comprises the *Energy Rangers* materials for schools, the *Energy Champions* materials for community management, various promotional and reward materials (posters, stickers, t-shirts, bags, caps, certificates, brochures), and a Energy and Power Meter Demonstration Board which is a demonstration board with a standard rotating disk energy meter, a pre-payment card meter, voltmeters and ammeters and various light sockets and power sockets.

Four specific areas of the EEEPack focus on:

Energy use, metering, recording and payment;
Identifying sources of energy wastage;
How to be energy efficient;
Evaluating the changes.

Upon completion of the EEEP it was presented at a Stakeholder Workshop in Broome where the key issues to arise were:

Viability of pre-payment meters in every community;
Local strategies should be used in each education program;
Interactive packages should be included where possible;
Support for the package needs to be maintained by educators;
Involve communities in solution preparation;
Utilise the existing structures in Aboriginal Media (BRACS);
Use energy efficient building practises.

4. Delivery of the Energy Efficiency Education Package

Delivery of the EEEP was contracted to RADG by the ECEPWG with consulting engineers Ove Arup & Partners as Program Manager. RADG firstly identified technical deficiencies in the EEEPack and then cultural problems by consultation with the ECEPWG. The EEEPack was subsequently modified before being printed for delivery to 7 regional centres and 40 communities across Western Australia.

The 7 regional EEEP workshops have been successfully delivered and delivery of the EEEP has been completed successfully in 35 of the 40 selected communities. Of the 5 communities not visited the reasons for this were the death of elders in 4 cases resulting protracted funeral ceremonies and difficulties in contacting the community in the fifth case.

Throughout the delivery the RADG focused on community management, regional service providers, and schools.

4.1 The EEEPack

The EEEPack prepared by CASE was modified by the RADG to address some of the deficiencies and a print run large enough to service the 47 sites was produced. However there are still serious concerns with regard to the quality of the EEEPack by schools, communities, RADG and the WA Curriculum Council and further development needs to be undertaken.

The experience of the RADG in the field enabled many of the weaknesses of the EEEPack to be overcome and deliver it in a positive manner that addressed the regional and local issues. The key assumption and slogan of the EEEPack "saving energy, saves us all money" was put into the context of Community Housing and Infrastructure Program (CHIP) and other essential service strategies being developed either regionally or on a state or national level. At the completion of each delivery, the RADG identified the supports that were required to assist the community or region to implement the EEEPack.

4.2 Regional Workshops

Awareness of energy efficiency issues was found to be generally low amongst most Regional Service Providers (RSPs) and communities. However in many cases they were supportive and interested in the goals of EEEP. It was very clear that the EEEPack cannot be sustained in isolation from a broader range of regional and community-based energy efficiency strategies.

The RSPs generally see that they can benefit from integrating the EEEP into a regional energy strategy that supports community energy efficiency initiatives. The RADG concludes that the adoption of efficient energy consumption practices within the 40 selected communities will largely depend on the RSPs ability to provide ongoing support to the communities. The selected Communities were found to be typically less aware of the reasons for the need of an EEEP. The communities gain through

increased awareness but to effectively take on energy efficiency practices there needs to be a regional policy framework that supports planned strategies in coordination with government.

4.3 Community Workshops

There was often a misconception that the EEEP is merely concerned with getting people to switch off lights when they are not being used and this issue needed to be quickly turned around in the community-based workshops. Many other issues such as those concerning social justice, staff entitlements, GST and the Diesel Fuel Rebate (DFR) were raised by community management. There was generally a positive response to the EEEP but not always a willingness to take up the message.

Given the difficulties often faced by community management it is clear that a holistic, multi-faceted approach needs to be taken to energy management in communities. The implementation of the EEEP in a community needs to ultimately lead to the establishment of a *Community Energy Action Plan*. This Plan will need to be enabled and supported through a Regional Energy Management Policy Framework guided by the RSPs.

4.4 Metering

The work to date has shown that the EEEP may have too much emphasis on community residential user-pays consumption metering. There are numerous other issues at a community and regional level which should be addressed before the implementation of metering in the residential housing sector. Other sectors that are significant consumers of electricity, i.e. municipal services, community facilities, enterprises and staff housing, need to have metering and energy management systems operational first. Moreover, it appears that this metering and effective recording will now be a requirement in all communities by the Australian Tax Office to substantiate diesel fuel rebate claims.

In general it appears that the introduction of pre-payment metering may be too rapid for people normally used to "chuck-in" and rental systems. In cases where pre-payment meters have been installed it was often evident that their introduction had not been accompanied by sufficient training and information for residents.

Moreover, it is apparent that metering and cost-recovery from the community residential sector has not been accompanied by the development of a holistic cost recovery plan for the community where all the sectors of electricity consumption are considered. It is apparent that communities may not only require further support from the RSPs in energy efficiency awareness-raising, but also in better financial management so as to ensure there is effective and equitable cost recovery across all sectors of electricity consumption.

The independent third party reading of electricity meters by the Regional Area Service Provider (RAESP) will ensure that there is integrity and accuracy of data collection. This is particularly important from the perspective of the retail function. The community will have reliable and independent measurements to negotiate future energy retail agreements with current users. It is important that the community sees itself as a producer, distributor and retailer of energy services.

4.5 Schools and the Curriculum Framework

The contract had not specified delivery directly to schools but the RADG decided to consult not only with regional staff of the three WA school systems (WA Education Department, Catholic Education and the Association of Independent Schools) but also with schools staff servicing each selected community and delivering workshops on the materials in as many of the schools as possible. In this way, ongoing consultation with the Curriculum Council and the head offices of the three school systems in Perth was supplemented with feedback directly from principals and teachers experienced at

working in Aboriginal communities. Moreover, the performance of the EEEPack *Ranger* program in the school setting was assessed by the Project Team in addition to the guidance provided by the WA Curriculum Council.

The WA Curriculum Council considers the EEEPack to be mid-range in comparison to various other packs and kits presented to Council. It does not stand out from others with regard to addressing Curriculum Framework criteria. The Curriculum Council has now confirmed in writing that the RADG has collaborated with its officers extensively which enabled the EEEPack to be revised to more effectively support the objectives of the Curriculum Framework.

There has been reluctance by some schools and staff to adopt the EEEPack modules and lesson plans. This seems to be due to a combination of concern with meeting the requirements of the Curriculum Framework, the relevance of the EEEPack to local conditions, and an expectation of more work.

To more effectively satisfy the diverse needs and cultures across the regions the EEEPack could be made available in an electronic form to allow for local adaptation, i.e. CD copy to be provided with the hard copy. While it would be ideal to have the EEEPack upgraded for a future expanded program, especially the schools materials, an editable electronic version will allow improvements to be made via local adaptation.

Where there is a commitment by schools to adopt the EEEPack in a future expanded program some resources may need to be made available to the school to support the local adaptation of the electronic materials and subsequent print production. This role of the school could then be extended to produce more appropriate materials for the community it serves.

4.6 Adult Lesson Plans

The development of the Adult Lesson Plans in draft module descriptor form was completed and some consultation on their suitability occurred. It has been proposed that the modules be used in training programs for indigenous Essential Service Operators (ESO), Environmental Health Workers and Housing Management Administrators. Preliminary advice indicates that only a single module, that pertaining to the physical design of housing and landscape, would be relevant for the EHWs. In addition, other feedback indicates that the current draft may be too advanced for the level of the ESOP training program. The Working Group will need to consider the possibility of piloting the delivery of the draft training modules.

4.7 Evaluation

The RADG developed survey instruments (questionnaires) specifically for the on-site and post-delivery phases of this project. However, it was found that these instruments were generally too complex and detailed for the project, particularly as a post-delivery tool for use by RSP officers and school staff. Nevertheless, they served as a useful prompt during delivery and a guide for data-gathering. On-site evaluation during delivery in most cases found that the EEEPack at a superficial level is satisfactory and there is support for its ongoing implementation by RSPs, communities and schools. Post-delivery evaluation assistance is to be provided by ATSIC and AAD officers and in some instances by Education Providers. It was necessary to conduct a large part of the post-delivery evaluation by means of telephone interview with the RSP officers and communities. This evaluation will be ongoing and final recommendations will be made on options to deliver the EEEP state-wide in an expanded program. Currently, it appears that the message has been effectively delivered and received by RSPs, communities and schools at many of the selected sites but, as one may expect with so many competing issues, there is no evidence yet of widespread implementation of energy efficiency policies or programs at these sites. This will require some time and more effort.

In many communities energy consumption will rise with increasing use of air-conditioning and appliances as they necessarily improve living conditions, develop to meet deficiencies in housing and infrastructure, and experience population growth. It may not be possible to achieve absolute savings

but slowing the rate of this increase will be possible through efficiency measures. This may require an *Community Energy Action Plan* to be devised with the community and to be implemented after delivery of the EEEP. Ongoing education would need to be sustained through the school and community training programs to ensure its effectiveness. These community strategies would need to be supported by a *Regional Energy Management Policy Framework*.

Ultimately, the goal of the RADG will be to help ATSIC, AAD and Ministry of Housing achieve their policy focus on energy efficiency practices, by linking the education package with the objectives of the *Essential Services Provision to Communities* policy and the *Community Housing Management Policy*. Household level energy usage patterns will be improved by sustaining a focus through these existing strong programs. A national program of energy efficiency education in remote indigenous communities is proposed as part of a bigger proposal to increase the amount of renewable energy systems being installed in these communities (Centre for Appropriate Technology, 1999). It is expected that the EEEP will have some influence on the establishment of this national program.

5. Conclusions

The EEEPack has been modified by RADG to address major deficiencies and a print run large enough to service the 47 sites will be produced. Throughout the delivery RADG focussed on community management, regional service providers, and schools. For the latter, negotiations with the 3 school systems and the Curriculum Council will seek to ensure that the EEEPack can be used in the state-wide curriculums. An expected outcome from the delivery of the EEEPack is the adoption of efficient energy consumption practices within designated Aboriginal communities, with energy savings in the longer term that reduce annual diesel fuel bills, and allow consideration of the introduction of renewable energy systems.

6. References

Centre for Appropriate Technology (1999), *A Proposal for a National Strategy to Promote Renewable Energy in Remote Indigenous Communities*, Aboriginal & Torres Strait Islander Commission, Canberra.

Connell Wagner Pty Ltd (1999), *Assessment of Energy Use and Fuel Efficiency in Remote Aboriginal Communities in Western Australia*, Draft Report, Ove Arup & Partners, Perth.

Healey Engineering (1999a), *Energy Audit and Review of Energy Costs of Jigalong Aboriginal Community*, Aboriginal Affairs Department, Perth.

Healey Engineering (1999b), *Energy Audit and Review of Energy Costs of Oombulgarri Aboriginal Community*, Aboriginal Affairs Department, Perth.

International Centre for Application of Solar Energy (1999), *Educational Awareness Package on Energy Efficiency in Discrete Aboriginal Communities – C36.98*, ECEPWG, Perth.

Ove Arup & Partners (1999), *Consultancy for the Delivery of an Energy Efficiency Education Program in Selected Aboriginal Communities in WA*, Tender Document, ECEPWG, Perth.

Power and Energy Services/Healey Engineering (1999), *Report on Buttah Windee Power Supply Options*, Office of Energy, Perth.